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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/904,131	07/11/2001	Tetsuzo Ueda	53074-026	2396

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EXAMINER

SONG, MATTHEW J

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 01/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/904,131

Applicant(s)

UEDA, TETSUZO

Examiner

Matthew J Song

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 13 December 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 11-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 11-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 18 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear in claim 18 whether the radiation source or the layered substrate is without a heat sink material.

3. Claim 18 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 18 recites "an epitaxial growth method" in the preamble, but there is no positive recitation of a growth in the body of the claim; the claim is directed to a heating method.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(c) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 11-12 are rejected under 35 U.S.C. 102(b) as being anticipated by Gmitter et al (US 4,846,931).

Gmitter et al discloses a single crystal GaAs substrate **1** having a thin release film **2** on the surface thereof, this reads on applicant's layered substrate, and epitaxially growing p-type and n-type GaAs layers **3** and **4**, thereon. Gmitter et al also discloses the release film can be AlAs or $\text{Al}_x\text{Ga}_{1-x}\text{As}$ (col 3, ln 1-67 and Fig 2). Gmitter et al also discloses selectively etching away the release film (col 2, ln 20-35). Gmitter et al is silent to the two layer of the layered substrate have different thermal coefficients, but this is inherent to Gmitter et al because the different materials of the layered substrate, GaAs and AlAs or $\text{Al}_x\text{Ga}_{1-x}\text{As}$ inherently have different thermal coefficients

6. Claims 15-16 and 19-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Hansson (DE 198 47 101), where US 6,316,361 is used an accurate translation, but a translation of DE 198 47 101 can be provided upon request.

Hansson discloses placing a semiconductor wafer in a CVD reactor **1** having an upper reaction chamber **2**, a lower reactor chamber **3** and a dividing wall **4** and a holding ring **6**, heating the semiconductor wafer and depositing a layer on the back of the wafer and simultaneously depositing an epitaxial layer on the front and the back of the wafer by feeding various process gases into the two reactor chambers (col 3, ln 1-67, col 4, ln 30-65 and Fig 2 of '361). Hansson discloses an advantage is that epitaxial layers can be deposited simultaneously on both sides of a wafer using only one CVD reactor (col 2, ln 25-65 of '361). Hansson also

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discloses a polysilicon layer can be deposited on the back of the wafer (col 3, ln 11-16 of '361). Hansson also discloses while at least one epitaxial layer is being deposited on the front of the wafer in the upper reactor, the lower reactor is flushed with inert flushing gas (col 3, ln 25-33 of '361).

Referring to claim 19, Hansson teaches a holding ring **6**, this reads on applicant's placing a substrate in a system so that each side of the substrate is not completely covered by any parts or susceptor blocks, and a dividing wall, this reads on applicant's preventing mixing of the two sets of reactant gases.

Referring to claim 20, Hansson teaches a diving wall **4**, this reads on applicant's physical partition.

Referring to claim 21, Hansson teaches inert flushing gases, this reads on applicant's inert gas flows.

7. Claims 15-16 and 19-21 are rejected under 35 U.S.C. 102(e) as being anticipated by Hansson (US 6,316,361).

Hansson discloses placing a semiconductor wafer in a CVD reactor **1** having an upper reaction chamber **2**, a lower reactor chamber **3** and a dividing wall **4** and a holding ring **6**, heating the semiconductor wafer and depositing a layer on the back of the wafer and simultaneously depositing an epitaxial layer on the front and the back of the wafer by feeding various process gases into the two reactor chambers (col 3, ln 1-67 and col 4, ln 30-65 and Fig 2). Hansson discloses an advantage is that epitaxial layers can be deposited simultaneously on both sides of a wafer using only one CVD reactor (col 2, ln 25-65). Hansson also discloses a

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polysilicon layer can be deposited on the back of the wafer (col 3, ln 11-16). Hansson also discloses while at least one epitaxial layer is being deposited on the front of the wafer in the upper reactor, the lower reactor is flushed with inert flushing gas (col 3, ln 25-33).

Referring to claim 19, Hansson teaches a holding ring **6**, this reads on applicant's placing a substrate in a system so that each side of the substrate is not completely covered by any parts or susceptor blocks, and a dividing wall, this reads on applicant's preventing mixing of the two sets of reactant gases.

Referring to claim 20, Hansson teaches a diving wall **4**, this reads on applicant's physical partition.

Referring to claim 21, Hansson teaches inert flushing gases, this reads on applicant's inert gas flows.

8. Claims 15-16 are rejected under 35 U.S.C. 102(b) as being anticipated by Rohm Co LTD (JP 60-154524), an English abstract has been provided.

Rohm Co LTD discloses an epitaxial layer is grown on both front and back sides of a wafer simultaneously and a coil **4** is set at an approximate temperature of 1150°C, this reads on applicant's elevated temperature, using a high frequency power source (Abstract).

9. Claims 11-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Manabe et al (US 5,620,557).

Manabe et al discloses a sapphire substrate **1**, intermediate ZnO layers **2a**, **2b**, on the sapphire substrate and forming GaN layers **3a**, **3b** by Metal organic vapor phase epitaxy on the

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intermediate ZnO layers, where the sapphire substrate and intermediate ZnO layer reads on applicant's layered substrate (col 2, ln 55 to col 3, ln 19). Manabe et al also discloses the sapphire substrate with the intermediate ZnO layers and the GaN semiconductor layers was dipped into an etching liquid of hydrochloric acid and the intermediate ZnO layers were etched off, thereby the GaN semiconductor layers were separated from the sapphire substrate (col 3, ln 20-35). Manabe et al is silent to the two layers of the layered substrate have different thermal coefficients, but this is inherent to Manabe because the two different materials of the substrate inherently have different thermal coefficients. Manabe et al also discloses GaN layers are formed by releasing reactant gases over both surfaces of the sapphire substrate (col 3, ln 15-24). Manabe et al also teaches other III-V nitrides, $\text{Al}_x\text{Ga}_y\text{In}_{1-x-y}\text{N}$, can be formed (claim 1).

Referring to claim 12, Manabe et al teaches an etching fluid capable of etching ZnO only (col 2, ln 13-16).

Referring to claim 14, Manabe et al teaches gallium nitride **3a** on zinc oxide **2a** on sapphire **1** on zinc oxide **2b** (Fig 3).

Referring to claim 15-17, Manabe et al teaches releasing reactant gases over both surfaces of a substrate to form GaN or $\text{Al}_x\text{Ga}_y\text{In}_{1-x-y}\text{N}$, which are III-V nitride alloys.

Referring to claim 18, the office has interpreted claim 18 to have a layered substrate without a heat sink material. Therefore, Manabe et al is silent to a layered substrate without a heat sink material, but this is inherent to Manabe et al because Manabe et al teaches a similar layered substrate of ZnO and sapphire, as applicant.

Claim Rejections - 35 USC § 103

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10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claim 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hansson (DE 198 47 101) or Hansson (US 6,316,361) in view of Manabe et al (US 5,620,557).

Hansson ('101) or Hansson ('361) discloses all of the limitations of claim 22, as discussed previously, except both sets of reactant species comprise a nitrogen source and a group III metal source.

In a method of making a semiconductor, Manabe et al discloses a sapphire substrate **1**, intermediate ZnO layers **2a, 2b**, on the sapphire substrate and forming GaN layers **3a, 3b** by Metal organic vapor phase epitaxy on the intermediate ZnO layers (col 2, ln 55 to col 3, ln 19). Manabe et al also discloses GaN layers are formed by releasing reactant gases of ammonia, a nitrogen source, and trimethyl gallium, a group III metal source, over both surfaces of the sapphire substrate (col 3, ln 15-24). Manabe et al also teaches other III-V nitrides, $Al_xGa_yIn_{1-x-y}N$, can be formed (claim 1). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Hansson ('101) or Hansson ('361) with Manabe et al to form gallium nitride, which is a useful compound semiconductor for light emitting diodes (col 1, ln 10-26).

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Referring to claim 23, the combination of Hansson and Manabe et al teaches supplying nitrogen and a group III metal and forming a polysilicon protective layer on the back side using trichlorosilane (col 3, ln 25-30).

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Calviello et al (US 5,356,831) teaches a substrate of sapphire, silicon carbide or metal oxide with a buffer layer of Al_2O_3 , thereon and growing a compound semiconductor on the buffer layer (col 2, ln 35-68)

Kiyoku et al (US 6,153,010) teaches a GaN buffer layer on a sapphire substrate and growing a GaN crystal on the buffer layer and removing the buffer layer and substrate after the growing the GaN crystal (Example 15).

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953. The examiner can normally be reached on M-F 9:00-5:00.

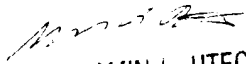
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on 703-308-3868. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song
Examiner
Art Unit 1765

MJS
December 31, 2002


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